



Maintenance of Brakes

A brake is a mechanical device, which inhibits motion. Its opposite component is clutch. Most commonly, brakes use friction to convert kinetic energy into heat, though other methods of energy conversion may be employed. Brakes are generally applied to rotating axles or wheels, but may also take other forms, such as the surface of a moving fluid (flaps deployed into water or air). Some vehicles use a combination of braking mechanisms, such as drag racing cars with both wheel brakes and a parachute or airplanes with both wheel brakes and drag flaps raised into the air during landing.

In this unit, you will develop an understanding of the brake maintenance at regular intervals so that vehicles efficiency increases.

SESSION 1: BRAKE AND ITS MAINTENANCE

Principle of Braking

The brake is a friction creating device, which causes speed reduction of the vehicle at a faster rate than the speed reduction obtained by changing the gears and closing down the accelerator.

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Functions of a Good Braking System

- The brakes should stop the vehicle in shortest possible distance and without skidding the vehicle.
- The brakes should work equally well both on fair and bad roads.
- Pedal effort applied by the driver should not be more, so as, not to strain the driver.
- Brakes should work equally well in all weathers.
- It should have very few wearing parts.
- It should require little maintenance.
- Brakes, when applied should not disturb the steering geometry.
- There should be minimum sound when brakes are applied

Different Types of Brakes

- Mechanical brakes
- Hydraulic brakes
- Vacuum servo brakes
- Pneumatic brakes
- Disc brakes

Mechanical brakes

Brakes which operate mechanically by using cam, rod and linkage with drum brake.

Hydraulic brakes

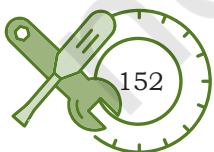
Brakes which are operated by the pressure on hydraulic fluid are called hydraulic brakes. This braking system consists of master cylinder, fluid line, wheel cylinder and drum brake.

Vacuum servo brakes

Application of brake is assisted by engine vacuum for suction and is called vacuum servo brake. This system consists of vacuum reservoir, master cylinder, vehicle control unit and server with diaphragm.

Pneumatic brakes

Brakes which are assisted to work on compressed air are called pneumatic brakes. Braking system consists of following components; air compressor, air tank,



safety valve, brake valve, brake chamber, diaphragm or chamber with drum brake.

Disc brakes

Disc is mounted on the wheel, instead of brake drum, which rotates between caliper assembly. Caliper pads or friction pads are operated hydraulically by means of piston, which comes in contact with rotating disc. Due to friction it reduces the speed of the disc as well as wheel. System consists of master cylinder, caliper assembly, caliper pad or friction pad and disc.

Different types of braking systems are used in different class of vehicles as per the load carrying capacity, which takes care of the momentum of vehicle.

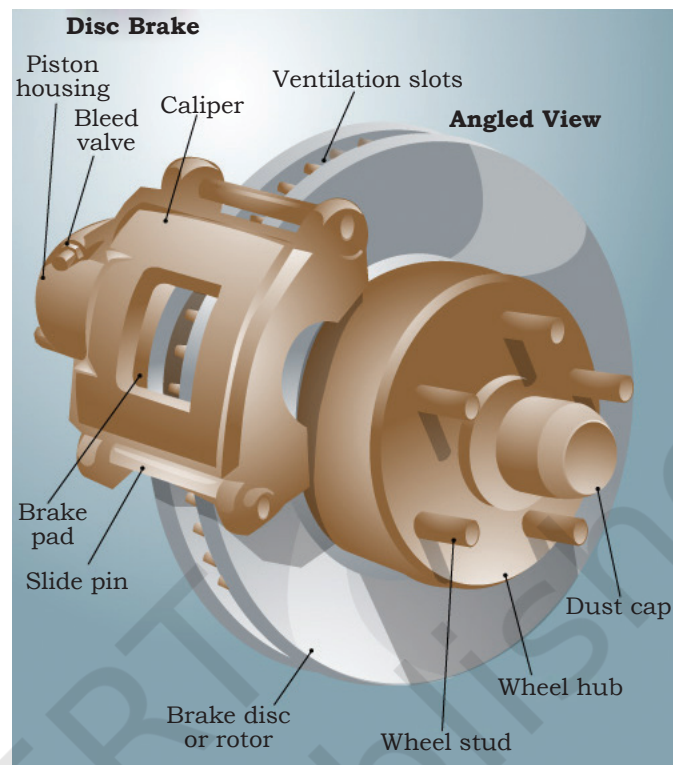


Fig. 9.1: Disc Brake

Servicing and Repairing of Mechanical Brakes

Steps for Repairing Mechanical Brakes

- Remove or unthread the wheel nuts with spanner and separate the wheel from brake drum.
- Straighten and pull out the split pin, fitted in castle nut, using combination plier.
- Lock the axle shaft and open the castle nut using socket and handle.
- Hammer the axle shaft lightly by using brass drift, this may contract the brake drum loose and remove the brake drum.
- Remove brake shoe lock, mount on anchor pin, with the help of nose plier.
- Serrate the brake shoes from brake lever cam and the steady post.
- Clean the brake shoes and the brake drum with the help of emery paper.
- Fit both the shoes on the cam and anchor pin and lock them.

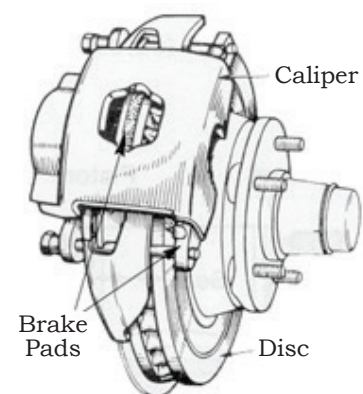


Fig. 9.2(a): Components of a Brake

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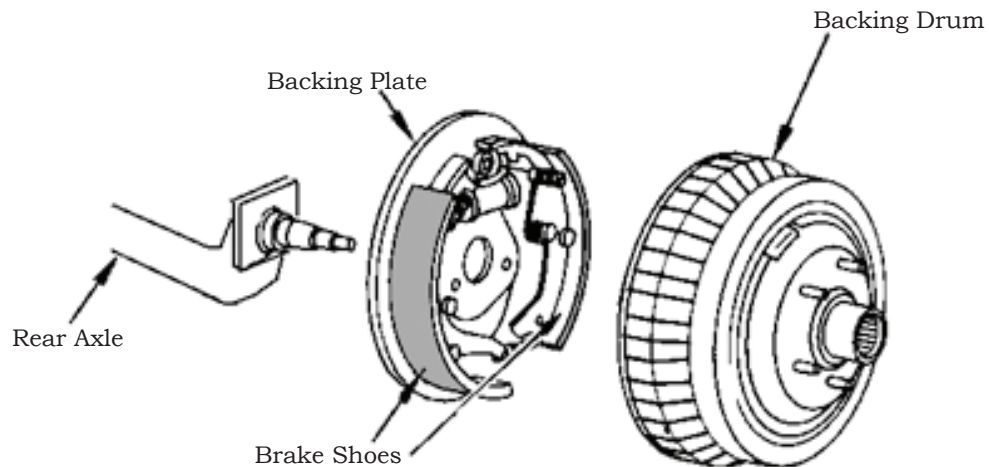


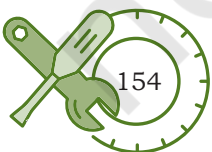
Fig. 9.2(b): Components of a Brake

- Fit the brake drum over the axle shaft and tighten the castle nut with the help of socket and handle.
- Tighten the brake shoe adjusting nut with the help of spanner, this makes the shoes to expand and grip the drum firmly.
- Loosen the adjusting nut by a little amount and turn the wheel, it must roll free. Do the shoe adjustment this way.
- Tighten the main nut locked it properly.
- Fit the wheel over brake drum and tighten wheel nuts.
- Take a road test of the vehicle.

Precautions during Servicing of Mechanical Brakes

- Shoe's lock must be placed properly.
- Shoe's adjustment should be done properly.
- If there is any lubricant, etc., on brake lining, it must be cleaned by washing the brake shoe with petrol and further cleaned using emery paper.
- Brake cable should be checked for its tension and fitted straight.
- Free play should always be kept in brake pedal.
- Shoe return spring should be checked for its tension and fitted straight.
- Replace the brake drum, if it is worn out beyond specifications; never get the sleeve fitted in it.

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- Spilt pin should be placed in castle nut and bended.
- Spring washer should be placed below each wheel nut and these nuts must be tightened in the right manner and with the right torque. Over-tightening may damage the stud or threads.
- Brake's testing should be done at nominal speed of 20–35 km/hr only.

Hydraulic Brakes

Overhauling of Wheel Cylinder

- Place an obstacle to rear wheels and serrated from wheels hub plate using ring spanner.
- Rest the vehicle's front on iron horses by lifting with the help of jack and placing them below front axle.
- Straighten the lock washer of 'check nut' of stub axle.
- Serrate the brake drum from stub axle. The drum comes out with bearing.
- Serrate the brake hose pipe from the brake pipe line.
- Take out the shoe's lock with the help of combination plier and serrate the spring and locks from shoes.
- Take out the shoe return springs, this will make the shoes serrated from wheel cylinder and steady post.
- Take off the dust caps of wheel cylinder and dismantle them. There will be the piston, bore, spring and rubber seals. Check them for being 'OK'.
- Wash the assembly (metal parts) using petrol and fit the assembly (housing) on another plate and reassemble it.
- Fit the anchor plate over the stub axle and tighten it properly.
- Fit the shoes along with the return spring and lock it.
- Join the brake hose connections and tighten the brake line.
- Place the wheel and brake drum over axle.

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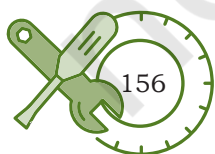
- Adjust the wheel bearing's free play.
- Take out the iron horses by lifting the vehicle, a little up and then rest it down.
- Take out the jack, and tighten the hub nut.
- This completes your job of overhauling the wheel cylinder assembly.

Precautions during Servicing of Hydraulic Brake

- If return springs are worn out or weak, replace them immediately.
- Dust cover should be replaced if, it is torn- out.
- Brake lining should be cleaned with petrol and emery paper.
- Brake shoe lock should be placed properly.
- Anchor plate's bolt should be tightened properly.
- Bearing should be checked and adjustment should be made to it before fitting the brake drum.
- Wheel cylinder's rubber washers (kit) should be replaced.
- Brake hosepipe should be joined properly and if there is any leakage, it must be checked and rectified.
- Original and proper brake fluid should be filled.
- Brake system's bleeding should be done after completing the job.

Overhauling of Master Cylinder

- Drain out the master cylinder from the reservoir.
- Disconnect the brake pedal connection from the master cylinder.
- Using nose plier, remove the locking clip and then takeout piston, primary and secondary cups, check valve with spring.
- Wash all the components of master cylinder thoroughly with the help of clean brake fluid.
- Check the components for service limit.
- Clean the bypass and intake ports and outlet passage of master cylinder.
- Assemble all the components with new master cylinder kit.

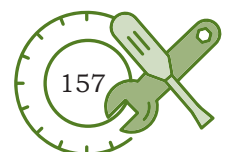


- Fit back master cylinder on the vehicle.
- Connect the brake fluid line to the master cylinder outlet.
- Ensure that master cylinder reservoir cap is clean and clear.

Bleeding

- Process of removing trapped air from the fluid line is called 'bleeding' otherwise, it may cause spongy brakes.
- Fill the master cylinder's reservoir with brake fluid up to the topmost level marked on it.
- Ask the companion to sit on driver's seat and create fluid pressure by pressing and releasing the brake pedal several times. You will feel that the pedal becomes hard.
- Asked the companion to keep up foot pressure on brake pedal.
- Insert one end of the pipe over the bleeding nipple and let the other end in a glass bottle or jar.
- Release the fluid pressure by opening the bleeding nipple and farther most wheel cylinder from master cylinder. There will be bubbles with brake fluid coming out in the bottle or jar.
- Tighten the nipple and the brake pedal goes to floorboard as air and brake fluid are released from the nipple.
- Again ask your companion to repeat the procedure and release the pressure through the same nipple. This time there should be no bubbles and only the brake fluid should be coming out of it.
- Check the fluid level, it will be bit down, then top-up the level.
- Apply the same steps to other wheel cylinders also, turn by turn.
- Checked the free play of brake pedal.
- Adjust the free play by unthreading the push rod.
- Test the vehicle for roadworthiness. All the four wheels should have the same grip as this ensures a good brake.

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Important note

- Bleeding operation is to be carried out on the wheel cylinder, which is farthest from the master cylinder.
- If the master cylinder is provided with bleeder valve and bleeding to be carried out first on the master cylinder.
- Bleeding operation can also be carried out with the help of pressure bleeder machine.

Steps for Servicing of the Disc Brakes

- Keep the vehicle on hard surface.
- Loosen the wheel nuts.
- Raise the front portion of a car to support the chassis with stand.
- Remove the wheel nuts and remove the wheel.
- Loosen the castle nut and remove hub from splined shaft.
- Unscrew the bleeder valve and drain the brake fluid from fluid line.
- Now loosen the bolts of caliper holder from caliper assembly and remove the friction pads and dust caps.
- Slowly remove the scaling ring from assembly.
- Unload the caliper assembly.
- Remove the piston, dust cover, return spring and keep it aside.
- Thoroughly clean all components and inspect for wear.
- Inspect the disc surface for scratches.
- Measure the defect in the disc and if more, replace the disc or it will create shaking steering or brake judder.
- Inspect the thickness of disc (std-11mm, limit 9.5mm).
- Inspect the piston for wear or replace the kit.
- Assemble the disc on the hub.
- Fix the piston in caliper assembly with rubber seals.
- Also, replace the brake pads and assemble the wheel.



- Add the brake fluid in reserve tank.
- Carry out brake bleeding operation after adjusting friction pads.
- Test the working of brakes.

Parking Brakes

It is a special type of brake, designed to assist the normal braking system, when it is necessary to hold the vehicle or to hold heavy load descending or inclining. It is also used for parking a vehicle.

Level Servicing of the Parking Brake

- Pull up the parking brake lever.
- Count the number of notches the lever has travelled. If it is more than 3 to 4 notches, then, adjust brake shoe clearance or adjust the brake cable.
- Regularly check the free operation of the brake.

Practical Exercise

1. List the types of braking system used in a vehicle.

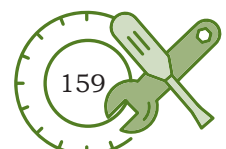
Sr.No.	Name of vehicle	Type of Brake

Check Your Progress

A. Fill in the blanks

1. _____ fluid is used for hydraulic brakes of the vehicle.
2. Brake fluid should be changed _____ in a year.
3. _____ is a special type of brake, designed to assist the normal braking system.
4. Bleeding operation can also be carried out with the help of _____.
5. _____ is the reason for spongy brake.

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B. Multiple choice questions

1. Mechanical brakes operate mechanically by using _____.
(a) cam
(b) follower
(c) piston
(d) None of the above
2. How can a vehicle be stopped in shortest possible distance and without skidding the vehicle?
(a) With brake
(b) By friction
(c) By changing gears
(d) With clutch
3. Which is not a type of brake?
(a) Mechanical
(b) Hydraulic
(c) Vacuum servo
(d) Rolling
4. Brakes which are assisted to work on compressed air are called _____.
(a) pneumatic brakes
(b) hydraulic brakes
(c) vacuum servo brakes
(d) disc brakes
5. Brakes which are operated by the pressure on hydraulic fluid are called _____.
(a) hydraulic brakes
(b) pneumatic brakes
(c) vacuum Servo brakes
(d) mechanical brake

C. Answer the following questions

1. Why are vehicle brakes necessary?
2. What are the steps to be followed while servicing mechanical brakes?
3. What are the steps to be followed while servicing parking brakes?

